

CLAIMS

1-90. (canceled)

91. (new) Apparatus for generating a predistorted signal from an input signal to reduce distortion in an output signal generated by signal handling equipment based on the predistorted signal, the apparatus comprising:
an extractor adapted to generate an extracted signal from the input signal;
a generator adapted to generate a distortion signal based on the extracted signal, wherein the distortion signal comprises:
a second-order distortion component based on a second-order signal generated from the extracted signal; and
a fourth-order distortion component based on a fourth-order signal generated from the extracted signal; and
a modulator adapted to modulate the input signal based on the distortion signal to generate the predistorted signal.

92. (new) The invention of claim 91, wherein the distortion signal further comprises a sixth-order distortion component based on a sixth-order signal generated from the extracted signal.

93. (new) The invention of claim 91, wherein the distortion signal does not comprise any odd-order distortion components based on any odd-order signal generated from the extracted signal.

94. (new) The invention of claim 91, wherein the generator is a digital generator adapted to digitally generate the distortion signal.

95. (new) The invention of claim 91, wherein:
the distortion signal comprises an in-phase component and a quadrature component;
the in-phase signal comprises:
a first in-phase component based on the second-order signal; and
a second in-phase component based on the fourth-order signal; and
the quadrature signal comprises:
a first quadrature component based on the second-order signal; and
a second quadrature component based on the fourth-order signal.

96. (new) The invention of claim 95, wherein:
the in-phase signal further comprises a third in-phase component based on a sixth-order signal generated from the extracted signal; and
the quadrature signal further comprises a third quadrature component based on a sixth-order signal generated from the extracted signal.

97. (new) The invention of claim 91, wherein the modulator is adapted to:
divide the input signal into an in-phase component and a quadrature component;
multiply one of the in-phase and quadrature components by the distortion signal to generate a first product;
multiply the other component by only a first DC distortion component to generate a second product; and
combine the first and second products to generate the predistorted signal.

1 98. (new) The invention of claim 97, wherein the distortion signal further comprises a
2 second DC distortion component.

1 99. (new) The invention of claim 91, further comprising automatic gain control (AGC)
2 circuitry adapted to condition the extracted signal such that an envelope of the conditioned signal
3 maintains a substantially constant amplitude.

1 100. (new) The invention of claim 91, further comprising a controller adapted to control
2 operations of the generator.

1 101. (new) The invention of claim 100, further comprising one or more mixers, each mixer
2 adapted to multiply a portion of the extracted signal by a portion of the output signal to generate an input
3 signal to the controller.

1 102. (new) The invention of claim 101, wherein the one or more mixers comprise:
2 a first mixer adapted to multiply an in-phase portion of the extracted signal by a first portion of
3 the output signal to generate an in-phase input signal to the controller; and
4 a second mixer adapted to multiply a quadrature portion of the extracted signal by a second
5 portion of the output signal to generate a quadrature input signal to the controller.

1 103. (new) The invention of claim 100, wherein the controller comprises two or more control
2 paths, each control path adapted to generate a different-order control signal used by the generator to
3 generate a different-order distortion component in the distortion signal.

1 104. (new) The invention of claim 103, wherein each control path comprises:
2 a mixer adapted to multiply a portion of the output signal by a different-order signal generated
3 from the extracted signal to generate a product; and
4 an integrator adapted to integrate the product to generate a corresponding control signal.

1 105. (new) The invention of claim 103, wherein:
2 the controller comprises a transformer adapted to generate different-frequency components of the
3 output signal; and
4 each control path comprises:
5 a detector adapted to detect a power level of a different-frequency output component;
6 and
7 an integrator adapted to integrate the detected power level to generate a corresponding
8 control signal.

1 106. (new) The invention of claim 103, wherein each control path comprises:
2 a band-pass filter adapted to isolate a different-frequency component of the output signal;
3 a detector adapted to detect a power level of the different-frequency output component; and
4 an integrator adapted to integrate the detected power level to generate a corresponding control
5 signal.

1 107. (new) The invention of claim 91, wherein the input signal is an analog RF signal.

1 108. (new) The invention of claim 91, wherein the input signal comprises baseband in-phase
2 and quadrature components.

1 109. (new) The invention of claim 91, wherein:
2 the modulator comprises a phase shifter, an amplitude modulator, and a coupler;
3 the amplitude modulator is adapted to modulate the amplitude of the input signal based on the
4 distortion signal; and
5 the coupler is adapted to combine the outputs from the phase shifter and the amplitude modulator
6 to generate the predistorted signal.

1 110. (new) The invention of claim 109, wherein:
2 the phase shifter is adapted to shift the phase of a first portion of the input signal; and
3 the amplitude modulator is adapted to modulate the amplitude of a second portion of the input
4 signal, different from the first portion.

1 111. (new) The invention of claim 109, further comprising a second phase shifter adapted to
2 shift phase of one of a portion of the extracted signal and a portion of the output signal, wherein the
3 portions are combined to generate a signal used to control operations of the generator.

1 112. (new) The invention of claim 91, wherein the signal handling equipment comprises an
2 amplifier.

1 113. (new) A method for generating a predistorted signal from an input signal to reduce
2 distortion in an output signal generated by signal handling equipment based on the predistorted signal,
3 the method comprising:
4 generating an extracted signal from the input signal;
5 generating a distortion signal based on the extracted signal, wherein the distortion signal
6 comprises:
7 a second-order distortion component based on a second-order signal generated from the
8 extracted signal; and
9 a fourth-order distortion component based on a fourth-order signal generated from the
10 extracted signal; and
11 modulating the input signal based on the distortion signal to generate the predistorted signal.

1 114. (new) The invention of claim 113, wherein the distortion signal further comprises a
2 sixth-order distortion component based on a sixth-order signal generated from the extracted signal.

1 115. (new) The invention of claim 113, wherein the distortion signal does not comprise any
2 odd-order distortion components based on any odd-order signal generated from the extracted signal.

1 116. (new) The invention of claim 113, wherein the distortion signal is generated digitally.

1 117. (new) The invention of claim 113, wherein:
2 the distortion signal comprises an in-phase component and a quadrature component;
3 the in-phase signal comprises:
4 a first in-phase component based on the second-order signal; and
5 a second in-phase component based on the fourth-order signal; and
6 the quadrature signal comprises:
7 a first quadrature component based on the second-order signal; and
8 a second quadrature component based on the fourth-order signal.

1 118. (new) The invention of claim 117, wherein:
2 the in-phase signal further comprises a third in-phase component based on a sixth-order signal
3 generated from the extracted signal; and
4 the quadrature signal further comprises a third quadrature component based on a sixth-order
5 signal generated from the extracted signal.

1 119. (new) The invention of claim 113, wherein the modulating comprises:
2 dividing the input signal into an in-phase component and a quadrature component;
3 multiplying one of the in-phase and quadrature components by the distortion signal to generate a
4 first product;
5 multiplying the other component by only a first DC distortion component to generate a second
6 product; and
7 combining the first and second products to generate the predistorted signal.

1 120. (new) The invention of claim 119, wherein the distortion signal further comprises a
2 second DC distortion component.

1 121. (new) The invention of claim 113, further comprising conditioning the extracted signal
2 such that an envelope of the conditioned signal maintains a substantially constant amplitude.

1 122. (new) The invention of claim 113, further comprising controlling operations of the
2 generating.

1 123. (new) The invention of claim 122, further comprising multiplying a portion of the
2 extracted signal by a portion of the output signal to generate an input signal for the controlling.

1 124. (new) The invention of claim 123, comprising:
2 multiplying an in-phase portion of the extracted signal by a first portion of the output signal to
3 generate an in-phase input signal for the controlling; and
4 multiplying a quadrature portion of the extracted signal by a second portion of the output signal
5 to generate a quadrature input signal for the controlling.

1 125. (new) The invention of claim 122, comprising, for two or more control paths, generating
2 a different-order control signal used for the generating to generate a different-order distortion component
3 in the distortion signal.

1 126. (new) The invention of claim 125, comprising, for each control path:
2 multiplying a portion of the output signal by a different-order signal generated from the extracted
3 signal to generate a product; and
4 integrating the product to generate a corresponding control signal.

1 127. (new) The invention of claim 125, wherein:
2 the controlling comprises generating different-frequency components of the output signal; and
3 comprising, for each control path:
4 detecting a power level of a different-frequency output component; and
5 integrating the detected power level to generate a corresponding control signal.

1 128. (new) The invention of claim 125, comprising, for each control path:
2 isolating a different-frequency component of the output signal;
3 detecting a power level of the different-frequency output component; and

4 integrating the detected power level to generate a corresponding control signal.

1 129. (new) The invention of claim 113, wherein the input signal is an analog RF signal.

1 130. (new) The invention of claim 113, wherein the input signal comprises baseband in-phase
2 and quadrature components.

1 131. (new) The invention of claim 113, wherein the modulating comprises:
2 shifting the phase of the input signal;
3 modulating the amplitude of the input signal based on the distortion signal; and
4 combining the outputs from the phase shifting and the amplitude modulating to generate the
5 predistorted signal.

1 132. (new) The invention of claim 131, wherein:
2 the phase shifter is adapted to shift the phase of a first portion of the input signal; and
3 the amplitude modulator is adapted to modulate the amplitude of a second portion of the input
4 signal, different from the first portion.

1 133. (new) The invention of claim 131, further comprising shifting the phase of one of a
2 portion of the extracted signal and a portion of the output signal, wherein the portions are combined to
3 generate a signal used to control operations of the generating.

1 134. (new) The invention of claim 113, wherein the signal handling equipment comprises an
2 amplifier.

1 135. (new) Apparatus for generating a predistorted signal from an input signal to reduce
2 distortion in an output signal generated by signal handling equipment based on the predistorted signal,
3 the apparatus comprising:
4 means for generating an extracted signal from the input signal;
5 means for generating a distortion signal based on the extracted signal, wherein the distortion
6 signal comprises:
7 a second-order distortion component based on a second-order signal generated from the
8 extracted signal; and
9 a fourth-order distortion component based on a fourth-order signal generated from the
10 extracted signal; and
11 means for modulating the input signal based on the distortion signal to generate the predistorted
12 signal.

1 136. (new) Apparatus for generating a predistorted signal from an input signal to reduce
2 distortion in an output signal generated by signal handling equipment based on the predistorted signal,
3 the apparatus comprising:
4 an extractor adapted to generate an extracted signals from the input signal;
5 automatic gain control (AGC) circuitry adapted to condition the extracted signal so that the
6 conditioned signal envelope maintains a substantially constant amplitude;
7 a generator adapted to generate a distortion signal based on the conditioned signal; and
8 a modulator adapted to modulate the input signal based on the distortion signal to generate the
9 predistorted signal.

1 137. (new) A method for generating a predistorted signal from an input signal to reduce
2 distortion in an output signal generated by signal handling equipment based on the predistorted signal,
3 the method comprising:
4 generating an extracted signals from the input signal;
5 conditioning the extracted signal so that the conditioned signal envelope maintains a
6 substantially constant amplitude;
7 generating a distortion signal based on the conditioned signal; and
8 modulating the input signal based on the distortion signal to generate the predistorted signal.

1 138. (new) Apparatus for generating a predistorted signal from an input signal to reduce
2 distortion in an output signal generated by signal handling equipment based on the predistorted signal,
3 the apparatus comprising:
4 means for generating an extracted signal from the input signal;
5 means for conditioning the extracted signal so that the conditioned signal envelope maintains a
6 substantially constant amplitude;
7 means for generating a distortion signal based on the conditioned signal; and
8 means for modulating the input signal based on the distortion signal to generate the predistorted
9 signal.

1 139. (new) The invention of claim 91, wherein the generator is adapted to generate at least
2 one of the distortion components using a polynomial-based technique or a look-up table-based technique.

1 140. (new) The invention of claim 113, wherein at least one of the distortion components is
2 generated using a polynomial-based technique or a look-up table-based technique.

1 141. (new) The invention of claim 91, wherein:
2 the generator is adapted to generate first and second distortion signals based on the extracted
3 signal; and
4 the modulator is adapted to:
5 divide the input signal into an in-phase component and a quadrature component;
6 multiply the in-phase component by the first distortion signal to generate a first product;
7 multiply the quadrature component by the second distortion signal to generate a second
8 product; and
9 combine the first and second products to generate the predistorted signal.

1 142. (new) The invention of claim 113, wherein:
2 first and second distortion signals are generated based on the extracted signal; and
3 the input signal is modulated by:
4 dividing the input signal into an in-phase component and a quadrature component;
5 multiplying the in-phase component by the first distortion signal to generate a first
6 product;
7 multiplying the quadrature component by the second distortion signal to generate a
8 second product; and
9 combining the first and second products to generate the predistorted signal.